

ABSTRACT

A surface-emission laser diode comprises a cavity region over a semiconductor substrate and includes an active layer containing at least one
5 quantum well active layer producing a laser light and a barrier layer, a spacer layer is provided in the vicinity of the active layer and formed of at least one material, an upper and lower reflectors are provided at a top part and a bottom part of the
10 cavity region, the cavity region and the upper and lower reflectors form a mesa structure over the semiconductor substrate, the upper and lower reflectors being formed of a semiconductor distributed Bragg reflector having a periodic change
15 of refractive index and reflecting incident light by interference of optical waves, at least a part of the semiconductor distributed Bragg reflector is formed of a layer of small refractive index of $\text{Al}_x\text{Ga}_{1-x}\text{As}$ ($0 < x \leq 1$) and a layer of large refractive index of
20 $\text{Al}_y\text{Ga}_{1-y}\text{As}$ ($0 \leq y < x \leq 1$), the lower reflector is formed of a first lower reflector having a low-refractive index layer of AlAs and a second lower reflector formed on the first lower reflector, the second lower reflector has a low-refractive index layer of AlGaAs, any one
25 layer constituting the cavity region contains In.